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Original Article

A nurse-led long-term pelvic floor muscle training program in the management of female patients with overactive bladder – A study protocol for a randomized controlled trial

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ARTICLE INFO

Article history:
Received 10 December 2014
Received in revised form
27 April 2015
Accepted 29 April 2015
Available online 9 May 2015

Keywords:
Nurse-led pelvic floor muscle training
Symptoms
Quality of life
Female
Overactive bladder

ABSTRACT

Background: Previous research has suggested that pelvic floor muscle training (PFMT) offers a therapeutic benefit in patients with overactive bladder.
Methods: We conducted a single-blind, randomized trial of pelvic floor muscle training (PFMT) as compared with usual care. The intervention group ($n = 54$) received a 6-month a nurse-led long-term pelvic floor muscle training program (three sessions a day, 15–20 times per session) and the control group ($n = 53$) received usual care. All patients received 3-month solifenacin succinate tablets (5 mg – once daily). The treatment outcomes were measured by the Modified Oxford Scale (MOS), Overactive Bladder Symptom Score (OABSS) and the King's Health Questionnaire (KHQ) at baseline, 3 months and 6 months respectively.
Results: Of the 91 randomly assigned patients, 46 patients in the PFMT group and 45 patients in the control group completed the trial. The trial revealed statistically significant differences between groups in pelvic muscle strength at 3 months following the intervention ($p < 0.05$), but no significant difference was found between two groups in OABSS scores ($p > 0.05$). In regards to quality of life, the experimental group showed significant improvements compared to the control group on 6 of 10 domains ($p < 0.05$). At 6 months, there were significant improvements in OABSS scores and quality of life in the experimental group compared to the control group ($p < 0.05$). No adverse events were observed.
Conclusion: A nurse-led long-term (6 months) pelvic floor muscle training program may alleviate OAB symptoms effectively and improve the quality of life more than a short term (3 months) pelvic floor muscle training program combined with solifenacin succinate tablets.

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Peer review under responsibility of Chinese Nursing Association.
http://dx.doi.org/10.1016/j.ijnss.2015.04.009

1. Introduciton

Overactive bladder (OAB) is a syndrome complex characterized primarily by urgency, with or without urgency urinary incontinence, usually with frequency and nocturia [1]. Based on this definition, the first large population-based survey to evaluate the prevalence of all LUTS in five countries in 2006 reported the global prevalence of OAB was 11.8% (10.8% men; 12.8% women) [2]. In 2010 Yuliang Wang et al. reported the prevalence of OAB was 6.0% in china [3], though it is lower than most of other countries, it still brings detrimental impacts on patients' health-related quality of life [3,4] such as emotional distress, sexual problems, and influence on relationships with family members [2,5], and in recent years, OAB has become a hot issue among urologists.

Because of symptom variability, for a long time, OAB is believed to be a chronic condition that has no cure. In recent years, A focus was gradually placed on behavioral therapy [6]. Behavioral therapy includes bladder training, pelvic floor muscle training (PFMT), biofeedback, dietary changes, and multi-component approaches that combine bladder training with PFMT and/or biofeedback. And behavioral therapy and pharmacologic treatment were recommended to be the first line treatment according to the 2011 Chinese Urological Association (CUA) guideline [7]. Although behavioral therapy for OAB has been used to manage urinary incontinence for more than 50 years [8], the outcomes are still controversial. Some studies reported behavioral approaches can be effective in reducing episodes of incontinence and daily voids [9,10], some studies reported managing OAB with behavioral approaches treatment is moderate to weak for short term outcomes and weak for long term outcomes and harms [1,11]. As part of behavioral treatment, pelvic floor muscle training (PFMT), defined as repetitive selective voluntary contraction and relaxation of specific pelvic floor muscles [12], can modulate overactive bladder syndrome through both afferent and efferent stimuli of the detrusor muscle. Afferent stimuli from pelvic organs such as the vagina, cervix, and rectum can inhibit the sacral preganglionic innervation to the bladder as well as increase urethral pressure through the viscero–visceral reflex otherwise called the guarding reflex [12]. It was originally suggested for patients with stress incontinence since it is useful in inhibiting detrusor contractions. Because a detrusor involuntary contraction (detrusor overactivity) was observed in urodynamic study. It is spontaneous or provoked, during the filling phase, involving a detrusor pressure rise of greater than 15 cm H_2O above baseline [13]. Based on the above mentioned outcome, we speculate PFMT can be used to control bladder function in OAB patients. PFMT was also integrated into the treatment of urge incontinence and OAB as part of a broader behavioral urge suppression strategy in recent years [8]. However, a lack of consistency in study design, and comparison groups makes it impossible to provide consistent results regarding the effectiveness of PFMT in patients with OAB across studies. Wang et al. found that biofeedback associated pelvic floor muscle exercises resulted in greater change in muscle strength than electrical stimulation, but the clinical significance of the change was not examined [14]. Song C reported no additional benefit for reducing incontinence episodes or voids per day was found by adding behavioral treatments to pharmacologic approaches for reduction in incontinence [15–17]. Wyman JF finded significant improvement in quality of life immediately after intervention, but not at three months [18]. Based on the above mentioned information, the purpose of the current study was to investigate whether a 6-month PFMT combined with 3-month- tolterodine can improve OAB symptoms and quality of life in female patients with primary OAB (See Fig. 1).

2. Methods

2.1. Study participants

We conducted the trial from January 2012 through February 2013 at urological clinic of hospital, a comprehensive Hospital in Hangzhou, Zhejiang Province. The institutional review board of the hospital approved the study protocol. All eligible participants were diagnosed by one doctor who is the expert in overactive bladder at the urology clinic as primary overactive bladder using the 2002 ICS definition [1]. The inclusion criteria were as following: age ≥18 years, women who have a history of sexual life; Symptoms of OAB ≥3 months; Overactive Bladder Symptom Score (OABSS) ≥5; Urinary frequency ≥8 times/per day; At least 1 urgency in three days before being recruited; With or without urgency urinary incontinence; all of women will receive the treatment with tolterodine, no other antimuscarinic drugs. The exclusion criteria included pregnancy or planned pregnancy within one year, deafness, neurologic disorders, diabetes mellitus, and urinary tract infection. All patients provided written informed consent (See Fig. 2).

2.2. Study design

We assigned participants to PFMT or the control intervention in three randomization cycles, using computer-generated numbers. The randomized treatment assignments were sealed in opaque envelopes and were opened individually for each patient who agreed to be in the study.

Patients were randomly assigned, using computer-generated random assignment in a 1:1 ratio, to intervention group and control group. As randomization will be conducted via a centralized com puter randomization ser vice, allocation will be concealed until the point of randomization.

2.3. Intervention

At first, participants in experiment group were asked to perform PFMT under the guidance of a researcher, in which initially the researcher introduced the PFMT, explained its anatomy and principle. Then, participants were placed in lithotomy position, the researcher put her forefinger and middle finger into the participants' vagina after paraffin oil lubrication, the participants were asked to contract the pelvic floor muscles for 5–10 seconds, relax for 10 seconds after. If they could feel pressure surrounding the fingers, it was considered as correct muscle contraction. If participants

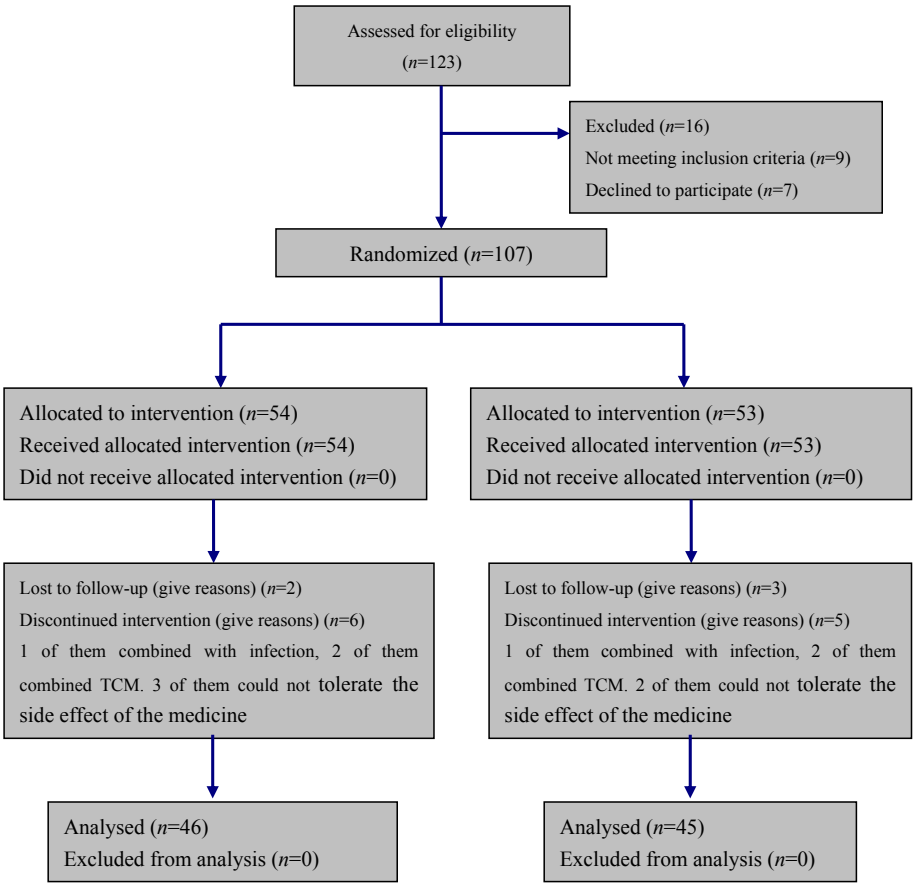

Fig. 1 – Flow diagram of the progress through the phases of a parallel randomized trial of two groups (that is, enrollment, intervention allocation, follow-up, and data analysis).

couldn't do it well, the research provides feedback finger pressure until correct contraction was achieved. When participants went back home and pelvic floor muscle training was conducted three sessions per day, 15–20 times per session, along with a health education program. When participants return to the clinic at month 1 and month 3, researcher measured the pelvic floor muscle strength, then conduct her correct contraction until all participant could do correct muscle contraction. Apart from this, a face to face education program on OAB was provided by the researcher which included professional information related to OAB, such as lifestyle and drinking habit change at first intervention and booklet were provided to participants. For instance, we asked participants to limit fluid intake and cut back on caffeine, tea

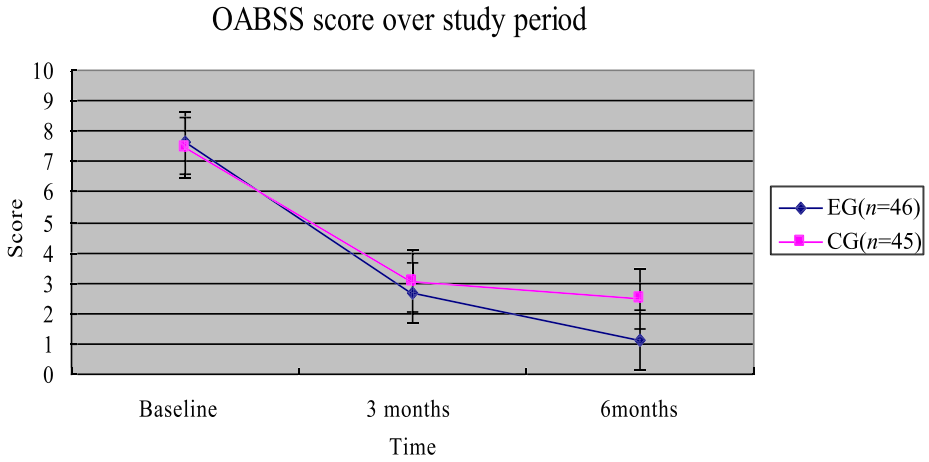

Fig. 2 – Changes in the OABSS scores over the study period.

etc. modify voiding habits and bladder training regimens include urge suppression or urge control techniques were provided in booklet. We also gave them the researcher's cell phone number to keep close contact with the participants, and also we called participants twice a week to make sure that the participants followed the Protocol. Participants in the control group received the health education program only. All participants in two group received the treatment with tolterodine sustained-release tablets (5 mg qd) for 3 months. Adverse effects and adherence with all the treatments were registered in a training diary updated by the research nurse during each clinic visit.

2.4. *Outcome measures and follow-up*

The primary outcome measure was the Modified Oxford Scale (MOS) [19]. which is the most commonly used scale for grading pelvic floor muscle function. This is a 6-point scale described as: 0 = no contraction; 1 = flicker; 2 = weak; 3 = moderate (with lift); 4 = good (with lift); 5 = strong (with lift). It is a low cost technique, and is relatively easy to conduct once sufficient instruction has been given and is well tolerated by patients. We measured the MOS for all participants at baseline and 3 months during trial respectively. These measurements were all obtained by the same clinical research nurse (See Fig. 3).

Secondary outcomes during the 12-week intervention included Overactive Bladder Symptom Score (OABSS) [20] and the King's Health Questionnaire (KHQ) [21]. OABSS are traditionally used to qualify OAB symptom and measure the intervention effects [20]. It contains four questions: the daytime frequency of urination (2 points), nocturia (3 points), urgency (5 points), and urgent incontinence (5 points). The total score are the sum scores of the four questions. The participants were recruited if they had a score of no less than 5. OABSS was measured for all participants at baseline, 3 months and, 6 months during trial respectively.

To assess health related quality of life, all participants were asked to complete the King's Health Questionnaire (KHQ) [21] at baseline and 3, 6 months respectively. KHQ is a measure of health related quality of life consists of multi item domains (role limitations, physical limitations, social limitations, personal relationships, emotions, sleep and energy, and severity (coping) measures), two one-item questions (incontinence impact and general health perceptions) and a multi item symptom severity domain. The 7 multi-item domains and the 2 single-item domains of the KHQ were scored from 0 (best) to 100 (worst). The Symptom Severity domain was scored from 0 (best) to 30 (worst) [22].

Throughout the entire intervention period, we monitored adverse events, using a standard adverse event case report form at each visit. This form included a description of all unanticipated benefits and undesirable experiences, particularly falls and exacerbations of fibromyalgia symptoms. Lack of an effect with PMFT or wellness education was not considered an adverse event (See Fig. 4).

2.5. *Statistical analysis*

We analyzed only the data for those patients who completed the whole trial. For statistical analysis, SPSS17.0 software was used. Chi-square test was used to compare the demographic characteristics between groups. ANOVA of repeated measurement was used to compare the effects of pelvic floor muscle training on primary overactive bladder in female patients. A P value of less than 0.05 was considered statistically significant.

3. Result

3.1. *Baseline characteristics of the participants*

Between January 2012 through February 2013, we screened 107 patients .54 in experiment group, 53 in control group. Sixteen (15.0%) participants dropped out. Among them, five in experiment group and three in control group could not tolerate the side effects of tolterodine, such as dry mouth and impaired urination, etc. Four participants in the experiment group dropped out because they found the PFMT intervention unpleasant in some way. Another two from the control group quit the trial and changed to take traditional Chinese medicine instead. All of them dropped out at 2 weeks. 91 eligible participants were randomly assigned in equal numbers to either the PFMT intervention or the control intervention (Table 1). 46 from the experimental group and 45 from the control group. There were no significant demographic differences between the final subsets of those groups who actually completed the study. The baseline demographics of the two groups were outlined in Table 1.

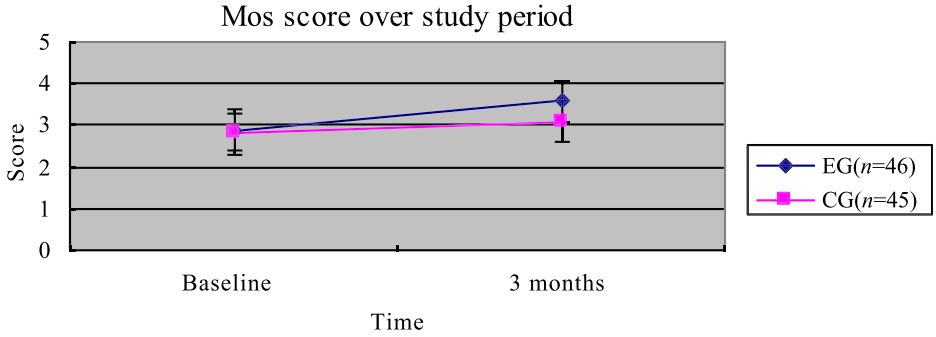

Fig. 3 – Changes in the MOS scores over the study period.

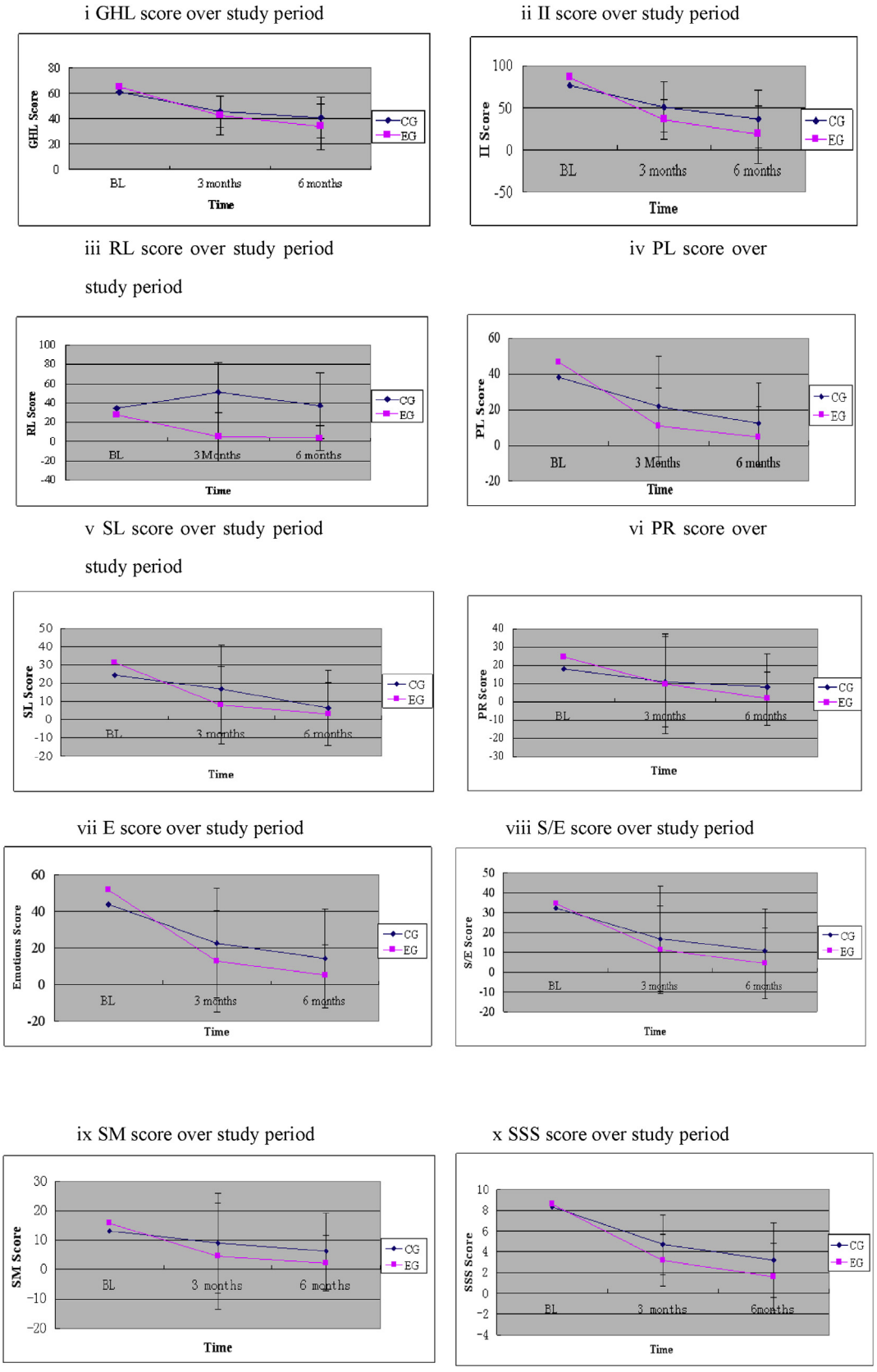

Fig. 4 – Changes in the KHQ domain scores over the study period: Changes in the median KHQ Domain scores over the study period: (i) General Health Perception' (GHP); (ii) Incontinence Impact (II); (iii) Role limitations (RL); (iv) Physical Limitation (PL); (v) Social Limitations (SL); (vi) Personal Relationships (PR); (vii) Emotions (E); (viii) Sleep/Energy (S/E); (ix) Severity Measures (SM); (x) Symptom Severity score (SSS).

3.2. *The effect of PFMT*

The effects on OAB symptom and change of pelvic floor muscle strength were shown in Table 2. From this table, we can see there is no difference between two groups at baseline. It has statistical differences between pre-intervention and post-intervention ($F = 5.942$, $p = 0.008$). F value in experiment group and control group are (245.325, 147.094), $p < 0.001$. OABSS scores in both group reached the highest level at baseline, then gradually go down and reached the lowest score. We also found there was no statistical differences ($t = -0.729$, $p = 0.468$) between two groups at 3 months, but it has statistical differences at 6 months between groups ($t = -3.099$, $p = 0.003$).

Regards to MOS, there is no difference between two groups at baseline. It has statistical differences between pre-intervention and post-intervention ($F = 14.574$, $p < 0.001$). F value in experiment group and control group are (72.911, 17.875), $P < 0.001$. MOS scores in both group improved at 3 months. Total effect also shown statistical differences between groups at 3 months ($F = 14.574$, $P < 0.001$).

A reduction in scores of the KHQ in both groups indicates better health related quality of life. As Table 3 shown there is no difference between two groups at baseline. After intervention, six of 10 domains include "Incontinence impact, Role limitations, Physical limitations, Social limitations, Emotions, Symptom severity" has statistical differences between groups at 3 months ($p < 0.05$). All domains except "General health perception" has statistical differences ($p < 0.05$) at 6 months. Scores of domains in both groups at baseline got the highest level, then gradually go down at 3 months and reached the lowest scores at 6 months. Compared to each time point, all domains has statistical differences ($p < 0.001$) in group.

4. Discussions

In current study, we find pelvic floor muscle training improved the pelvic floor muscle strength of the experiment group significantly at 3 months and 6 months compared to the control group as Table 2 showed. The result is similar to report by Aslan et al. that a significant increase in pelvic floor muscle strength in patients with urgency urinary incontinence after 8 weeks and 6 months [23]. Wang AC et al. also reported that a pelvic floor muscle exercise can significantly increased pelvic floor muscle strength parameters compared to vaginal electrical stimulation after 12 weeks [14]. However, our results showed no evidence supported pelvic floor muscle training enhance the effectiveness of tolterodine for reducing episodes of incontinence and voiding at 3 months. As Table 2 showed that OABSS score decreased in experiment group at 3 months compare to baseline in group, this outcome supported that tolterodine (extended release) might be offered as a treatment for overactive bladder syndrome, as it is associated with significant objective clinical improvement. But there were no statistically significance between two groups until 6 months. Therefore, it is important to note that stronger pelvic floor muscle does not mean lower score on OABSS. The result is similar to what is reported by Alex C et al. [14]. OABSS scores in experiment group were significantly lower than the control group at 6 months. It means that long term PFMT combined with pharmacotherapy may relieve overactive bladder syndrome effectively. The outcome is similar to the study reported by Ng SC who indicated that a home-based pelvic floor muscle exercise could improve symptoms significantly in the study group at 6 months [24]. Therefore, we conclude that a 6 months pelvic floor muscle training may be better to relieve the OAB symptoms. So behavioral interventions combined

Table 1 – Demographic characteristics of 91 participants ($n = 91$).

		EG ($n = 46$)	CG ($n = 45$)	Comparisons between two groups	
		n (%)	n (%)	x^2	p
Marital status	Married	40 (87.0)	41 (91.1)	0.401	0.526
	Unmarried	6 (13.0)	4 (8.9)		
Income (RMB/month)	>5000	1 (2.2)	1 (2.2)	0.001	0.999
	3000–5000	44 (95.7)	43 (95.6)		
	<3000	1 (2.2)	1 (2.2)		
Education level	Senior high school or above	13 (28.3)	9 (20.0)	0.874	0.646
	Junior high school	27 (58.7)	30 (66.7)		
	Primary school or under	6 (13.0)	6 (13.3)		
Mode of delivery	Vaginal	30 (76.9)	32 (80.0)	2.652	0.265
	Cesarean	9 (23.1)	6 (15.0)		
	Both vaginal and cesarean	0 (0)	2 (5.0)		
Delivery history	None	7 (15.2)	5 (11.1)	0.599	0.897
	1	25 (54.3)	27 (60.0)		
	2	11 (23.9)	11 (24.4)		
	≥3	3 (6.5)	2 (4.4)		
Duration of OAB (years)	>20	4 (8.7)	1 (2.2)	3.761	0.288
	10–20	7 (15.2)	4 (8.9)		
	5 ≤ years < 10	29 (63.0)	36 (80.0)		
	<5	6 (13.0)	4 (8.9)		

[a]Means Fisher exact probability test.

Table 2 – The OABSS, MOS scores of the participants at baseline and 3, 6 months ($\bar{X}$±SD).

	Baseline	3 months	6 months	Total	F	P
OABSS						
EG ($n = 46$)	7.61 ± 2.28	2.67 ± 2.80	1.13 ± 1.93	3.80 ± 3.63	245.325	**<0.001**
CG ($n = 45$)	7.44 ± 2.41	3.07 ± 2.31	2.47 ± 2.18	4.33 ± 3.19	147.094	**<0.001**
Total	7.53 ± 2.33	2.87 ± 2.56	1.79 ± 2.15	4.06 ± 3.42	383.123[b]	**<0.001**[b]
t	0.335	−0.729	−3.099	1.560[a]	$F = 5.942$[c]	
P	0.739	0.468	**0.003**	0.215[a]	**$p = 0.008$**	
MOS						
EG ($n = 46$)	2.87 ± 0.65	3.57 ± 0.58		3.22 ± 0.71	72.911	<0.001
CG ($n = 45$)	2.80 ± 0.55	3.09 ± 0.67		2.94 ± 0.63	17.875	<0.001
Total	2.84 ± 0.60	3.33 ± 0.67		3.08 ± 0.68	85.383[b]	**<0.001**[b]
t	0.550	3.625		5.399[a]	$F = 14.574$[c]	
p	0.584	**<0.001**		**0.022**[a]	**$p < 0.001$**[c]	

[a] F statistic and p value of group effect.
[b] F statistic and p value of time effect.
[c] F statistic and p value of cross over effect.

Table 3 – KHQ domains scores of the 91 participants at baseline and at 3, 6 months ($\bar{X}$±SD).

KHQ domain	Time	EG ($n = 46$)	CG ($n = 45$)	F	p
General health perception	Baseline	65.22 ± 15.35	61.11 ± 12.56	4.281[b]	**0.019**[b]
	3 month	42.39 ± 18.16	45.56 ± 16.24		
	6 month	33.70 ± 17.65	40.56 ± 16.24		
	Total	47.10 ± 21.59[b]	49.07 ± 17.39[b]		
Incontinence impact	Baseline	86.23 ± 23.91	76.30 ± 29.83	11.114[b]	**0.001**[b]
	3 month	36.23 ± 34.31	51.19 ± 34.43		
	6 month	18.84 ± 27.81	37.78 ± 34.53		
	Total	47.10 ± 40.63[a]	55.09 ± 36.47[a]		
Role limitations	Baseline	27.53 ± 25.14	34.44 ± 30.86	2.705[b]	0.087[b]
	3 month	5.07 ± 13.08	21.19 ± 27.93		
	6 month	3.63 ± 9.89	13.04 ± 22.00		
	Total	12.08 ± 20.41[a]	22.89 ± 28.40[a]		
Physical limitations	Baseline	46.73 ± 21.27	38.14 ± 28.12	11.231[b]	**0.001**[b]
	3 month	10.86 ± 16.92	21.84 ± 22.97		
	6 month	4.71 ± 12.49	11.84 ± 16.89		
	Total	20.77 ± 25.29[a]	23.94 ± 25.39[a]		
Social limitations	Baseline	31.38 ± 24.26	24.43 ± 24.10	8.875[b]	**0.001**[b]
	3 month	7.97 ± 17.15	16.78 ± 20.59		
	6 month	3.14 ± 9.83	8.63 ± 15.86		
	Total	14.16 ± 21.79[a]	16.61 ± 21.32[a]		
Personal relationships	Baseline	24.72 ± 27.30	18.00 ± 24.81	5.217[b]	**0.016**[b]
	3 month	9.75 ± 14.63	10.96 ± 18.04		
	6 month	1.90 ± 5.23	7.63 ± 14.78		
	Total	12.12 ± 20.36[a]	12.2 ± 19.99[a]		
Emotions	Baseline	51.90 ± 27.81	44.06 ± 30.06	8.374[b]	**0.002**[b]
	3 month	12.79 ± 16.38	22.70 ± 26.99		
	6 month	5.31 ± 13.39	14.80 ± 20.50		
	Total	23.33 ± 28.66[a]	27.19 ± 28.77[a]		
Sleep/energy	Baseline	34.42 ± 22.06	32.23 ± 26.45	2.420[b]	0.106[b]
	3 month	11.23 ± 17.93	16.66 ± 21.02		
	6 month	4.35 ± 11.88	10.74 ± 16.72		
	Total	16.67 ± 21.87[a]	19.88 ± 23.44[a]		
Severity measures	Baseline	15.77 ± 18.02	13.16 ± 16.99	5.690[b]	**0.010**[b]
	3 month	4.53 ± 9.42	9.08 ±12.92		
	6 month	2.18 ± 5.95	6.30 ± 10.83		
	Total	7.49 ± 13.52[a]	9.51 ± 14.00[a]		
Symptom severity	Baseline	8.59 ± 2.48	8.33 ± 2.88	7.0033[b]	**0.002**[b]
	3 month	3.17 ± 3.23	4.73 ±3.60		
	6 month	1.61 ± 2.68	3.20 ± 3.42		
	Total	4.46 ± 4.10[a]	5.42 ± 3.94[a]		

[a] $p < 0.05$ of group effect.
[b] F statistic and P value of crossover effect.

pharmacologic treatment were associated with symptom improvements comparable to medications alone. Even it is reported that the combination group had greater perceived improvement at 10 weeks, but no differences by group at 8 months [25]. For us, we believe that we should pay more attention on how combinations of behavioral intervention and pharmacologic treatment, it may take more influence on the effects of treatment. And also how long pelvic floor muscle training should be sustained and the adherence to intervention should be taken into consideration. Compliance with PFMT is a problem with discouraging long-term adherence to PFMT programs, it is reported adherence rates as low as 50% [26,27]. Some strategies were taken into current trial to improve patient compliance. First, we offered an education booklet and the researcher's cell phone number to keep close contact with the participants. Secondly, we call participants twice a week to make sure that the participants follow the protocol. At last, participants in both groups received health education, which can stimulate patients to follow the instruction to change their bad lifestyle, and encourage them to adhere to PFMT. In addition, there is low cost associated with PFMT, participants can easily grasped after researcher conducted, which is welcomed by our participants. In our study, the compliance rate with PFMT hit 90%.

Secondly, PFMT have a beneficial effect on health related quality of life. This was reflected by the decreased scores in experiment group on 5 of the 10 domains at 3 months including "Incontinence impact", "Role limitations", Physical limitations", "Social limitations", "Symptom severity". Vaart et al. [28] reported that women with OAB symptoms were especially limited in their mobility and that urge incontinence was associated with feelings of embarrassment. Compared to the findings of Vaart et al., [28] the responses to limitation of mobility (domain include physical limitation, Social limitations, Symptom severity) revealed the statistically significant post-intervention differences between the groups." as the result,participants reported Incontinence impact "also improved. At 3 months, domains of "General health perception" and "Personal relationship" had no difference between two groups. The outcome was similar to the study reported by Kubota Y who treated OAB with an antimuscarinic drug for 12 weeks [29]. Furthermore, domains of Emotions, Sleep/Energy were also no significantly different at 3 months, which is different from Alex C's study [18]. It may be related to a more conservative way of expression of Chinese people [30]. Different cultural background may have some influence here. At 6 months, all domains except "General health perception" have statistical differences between two groups at 6 months. Regards to the "General health perception", although scores of this domain decreased significantly from baseline to six months intervention in both groups, still has no statistical differences between two groups at 6 months. but the total effect shown it is improved during the intervention. We noted that the history of OAB of the participants $\geq$5 years hit 87%–91.1%, some of them suffering for more than 20 years. It is hard to reach a obviously satisfied with six months intervention. To conclude above mentioned that pelvic floor muscle training combined with pharmacotherapy may result in a better quality of life in female patients with primary overactive bladder.

Our study was limited by the fact that we only include female participants, therefore may not reflect generalized practice patterns. Furthermore, our sample size limited the comprehensive conclusions that can be drawn. Further studies are needed to choose the optimal training tool for PFMT. And also a longer follow up more than 6 months is highly recommended. However, our trial demonstrated that pelvic floor muscle training could relieve OAB symptom and have a beneficial effect on health related quality of life measurements. In our study, significantly greater post-intervention changes in pelvic floor muscle strength, OABSS scores, and scores of KHQ were noted after both PFMT group and control group. Moreover, we noted having greater muscle strength is not the same as having good management of OAB. Longer PFMT have better management of OAB in symptoms or greater improvement in quality of life.

5. Conclusions

As the first line treatment, the behavioral intervention is indeed take effect. Pelvic floor muscle training can improve pelvic floor muscle strength significantly, relieve symptoms and improve the quality of life. (3 months) may not be adequate for a complete symptom relief and improvement of quality of life. (6 months) pelvic floor muscle training is promising to alleviate OAB symptoms effectively and improve the overall quality of life of the patients. Long term (more than 6 months) PFMT should be introduced into treatment and the how long PFMT is the best for patients to manage the OAB should be recommend to research in the coming days.

6. Limitations

Our study was limited by the fact that we only include female participants, therefore may not reflect generalized practice patterns. Furthermore, our sample size limited the comprehensive conclusions that can be drawn. Further studies are needed to choose the optimal training tool for PFMT. And also a longer follow up more than 6 months is highly recommended. However, our trial demonstrated that pelvic floor muscle training could relieve OAB symptom and have a beneficial effect on health related quality of life measurements. In our study, significantly greater post-intervention changes in pelvic floor muscle strength, OABSS scores, and scores of KHQ were noted after both PFMT group and control group. Moreover, we noted having greater muscle strength is not the same as having good management of OAB. Longer PFMT have better management of OAB in symptoms or greater improvement in quality of life.

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